APPARATUS AND METHOD TO BRIDGE TELEPHONE AND DATA NETWORKS

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CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims the benefit of provisional patent application no. 60/475,471, filed June 3, 2003, entitled "Apparatus and Method to

10   Bridge Telephone and Data Networks", by inventors Stewart H. Sonnenfeldt, Venkatram R. Kuditipudi, Arno Penzias, and Subrah S. Iyar, the disclosure of which is herby incorporated by reference.

BACKGROUND OF THE INVENTION

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Field of the Invention

The present invention relates generally to communications technology.

20   ### Description of the Background Art

Various systems and services are now being offered to allow two or more users to participate in an online, collaborative meeting, in which the users may share and collectively review or edit applications, files, documents, and images.

25   Video may be available or supported for these meetings. One such service is provided by WebEx Communications, Inc., of San Jose, California. For example, the online meetings may be initiated through a website, and attendees may be invited to join via electronic mail (email). After joining such an online meeting using a web browser on their personal computers (PCs), the attendees may dial into a

30   conference call for reliable audio.

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SUMMARY

In accordance with one embodiment, the invention pertains to a
method for initiating an online meeting over a data network between a host party
with a first computer and an attendee party with a second computer. Consider that a
phone connection already exists over a telephone network between a first phone of
the host party and a second phone of the attendee party. A start meeting message
is sent over the data network to a data center. A meeting identification is
subsequently received from the data center. The meeting identification is stored in a
first device that is coupled to both the first phone and the first computer, and the
meeting identification is transmitted from the first device over the telephone network
to a second device, where the second device is coupled to both the second phone
and the second computer.

In accordance with another embodiment, the invention pertains to an
apparatus including first, second, and third interfaces. The first interface is
configured to connect to a handset for receiving and transmitting analog signals to
the handset. The second interface is configured to connect to a phone base for
receiving signals from and transmitting analog signals to a telephone network. The
third interface is configured to connect to a computer for receiving and transmitting
digital signals to a data network. Alternatively, in accordance with another
embodiment, the apparatus may be configured to connect between the phone base
and the telephone network. In such an embodiment, the apparatus may be
configured to accommodate and process both analog and digital phone signals.

In accordance with another embodiment, the invention pertains to a
customer premises equipment (CPE) device. The CPE device includes a first
interface configured to receive and transmit analog signals to a telephone network,
and a second interface configured to receive and transmit digital signals to a data
network. The device also includes a first user input mechanism to start a meeting
over a data network, and a second user input mechanism to join a meeting over the
data network.

In accordance with another embodiment, the invention pertains to an adaptor product configured to bridge a telephone network and a data network. The adaptor product includes means for transmitting a start meeting message over the data network to a data center and means for receiving a meeting identification from

5   the data center into the adaptor product. The adaptor also includes means for transmitting the meeting identification from the adaptor product over the telephone network to a second adaptor product. Alternatively, in accordance with another embodiment, caller identification (caller ID or CID) function may be utilized to facilitate launching or joining an online meeting.

10 In accordance with another embodiment, the adaptor device is configured to provide for the user to have phone calls by way of both the telephone network and the data network. Automatic phone answering and/or speed dialing may also be provided via the adaptor device and an application on the computer connected thereto. In accordance with another embodiment, the adaptor device is

15 configured to provide for the user to use the phone as an audio input to the computer

BRIEF DESCRIPTION OF THE DRAWINGS

20 FIG. 1 depicts a configuration of devices including a PC-PSTN adapter in accordance with an embodiment of the invention.

FIG. 2 is a diagram illustrating a method for starting a meeting over a data network in accordance with an embodiment of the invention.

FIG. 3 is a diagram illustrating a method for joining a meeting over a

25 data network in accordance with an embodiment of the invention.

FIG. 4A is a top view of an example implementation of the PC-PSTN adapter in accordance with an embodiment of the invention.

FIG. 4B is a side view of the example implementation of the PC-PSTN adapter in accordance with an embodiment of the invention.

30 FIG. 5 is a schematic diagram of the example implementation of the PC-PSTN adapter in accordance with an embodiment of the invention.

FIG. 6 depicts an alternate configuration of devices including a PC-PSTN adapter in accordance with an embodiment of the invention.

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DETAILED DESCRIPTION

As discussed above, online meetings are typically initiated using web browsers and email. However, such initiation of meetings does not take advantage of the fact that people are very accustomed to making and receiving voice calls on

10   their telephones. As described below, embodiments of the present invention take advantage of the ubiquity of and familiarity with telephone calls to facilitate the process of setting up online meetings over a data network.

FIG. 1 depicts a configuration of devices including a PC-PSTN adapter **104** in accordance with an embodiment of the invention. Broadly speaking, the PC-

15   PSTN adapter **104** functions as a kind of bridge between the Internet (via the PC) and the public switched telephone network (PSTN).

In this embodiment, the PC-PSTN adapter **104** is connected between a telephone base **102** and a telephone handset **103**. The connections may be via, for example, RJ 22, RJ 45, or other types of connectors depending on the telephone

20   system. Alternatively, these connections may be wireless, for example, by way of a Bluetooth or similar type of interface for certain phones.

The adapter **104** is also connected to a computer **106**. The connection to the computer **106** may be via a wired connection, such as, for example, a Universal Serial Bus (USB) connection or other type of wired connection.

25   Alternatively, the connection to the computer may be wireless, for example, by way of IEEE 802.11 standards or other technologies.

The telephone base **102** may be either an analog phone or a digital phone. In other words, the connection from the phone base **102** to the PSTN **101** may be either analog or digital. Advantageously, connecting the PC-PSTN adapter

30   **104** using the phone jacks between the phone base **102** and handset **103** enables the adapter **104** to be compatible with both analog and digital phones. This is

because, while connections from phone base **102** to PSTN **101** may be either analog or digital, connections between phone base **102** and handset **103** are generally analog.

5   The computer **106** may comprise a personal computer (PC), whether a desktop or laptop. The computer **106** includes a connection to the Internet **107** or, alternatively, to a proprietary wide area network.

      FIG. 2 is a diagram illustrating a method for starting a meeting over a data network in accordance with an embodiment of the invention. Both the host and an attendee of the meeting have a configuration of equipment including a PC-PSTN

10   adaptor **104**.

      At the beginning of the method, the host and the attendee are already on a phone line **202**. In other words, the host's phone **102a** is coupled to the attendee's phone **102b** via the PSTN **101**.

      In this case, the host and attendee would like to start an online meeting

15   between their computers **106a** and **106b** over a data network **107** in parallel to their phone conference over the telephone network **101**. Such an online meeting may include data communication and/or videoconferencing. As one example, the online meeting may utilize WebEx® technology which integrates voice, data communications, and videoconferencing. WebEx® technology includes an

20   interactive network with control over security and quality of service, a multimedia switching platform that provides real-time switching capabilities and can handle various types of digital content, and various interactive services including a meeting center service. In other examples, alternate technologies may be utilized for the online meeting over the data network. For instance, some of these technologies

25   utilize a shared server to upload a presentation that others then view.

      The host person gives a "start meeting" command **204** by way of a user input mechanism. For example, the user input mechanism may be pushing a "start" button on the PC-PSTN adaptor **104a**, which functions here as a kind of bridge from the telephone network **101** to the data network **107**. The start meeting

30   command indicates that the host desires to begin an online meeting with the person on the other end of the phone line.

The start meeting command is sent to the host computer **106a** , and the host computer **106a** transmits the start meeting command **206** over the data network **107** to a data center **108**. The data center **108** may comprise, for example, one such as the WebEx data center of WebEx Communications, Inc. Of course, the

5   invention is not limited to the WebEx data center. In other examples, other data centers may be utilized.

The data center **108** receives the start meeting command. The data center **108** generates a unique meeting number (or other form of meeting identification) to identify the online meeting being started and transmits **208** the

10   meeting number back to the host computer **106a**. The host computer **106a** sends **210** the meeting number to the host adaptor **104a**, which stores the meeting number in memory.

The host adaptor **104a** now functions as a kind of bridge from the data network **107** back to the telephone network **101** by sending **212** the meeting number

15   via the phone line to the attendee adaptor **104b**. Prior to sending **212** the meeting number via the phone line, the meeting number is encoded by the host adaptor **104a** into a form communicable over the telephone network **101**. In one example, the meeting number may be converted into a dual tone multiple frequency (DTMF) signal. Other encoding techniques may also be used.

20   The attendee adaptor **104b** receives the meeting number via the phone line. The meeting number may be received by the attendee adaptor **104b** monitoring the phone connection to detect and decode an encoded meeting identification. For example, the attendee adaptor **104b** may monitor the phone connection to detect and decode a DTMF signal.

25   In response to receiving the meeting number, the attendee adaptor **104b** provides an indication **214** to the attendee that an online meeting with the host is available to join. The indication **214** may be, for example, a visual indication in the form of a flashing light emitting diode (LED) on the attendee adaptor **104b**. Other forms of indication may be used instead or in addition, such as an audio indication.

30   If the attendee person wishes to join in an online meeting with the host, then, in response to the indication **214**, the attendee gives a "join meeting" command

216 by way of a user input mechanism. The user input mechanism may be, for example, pushing a "join" button on the attendee adaptor **104b**. The join meeting command indicates that the attendee desires to join in an online meeting with the host.

5 The join meeting command along with the meeting identification number is sent **218** from the attendee adaptor **104b** to the attendee computer **106b**. The attendee computer **106b** transmits **220** the join meeting command and the specific meeting number over the data network **107** to a data center **108**. The data center **108** then coordinates the online meeting between the host computer **106a**

10 and the attendee computer **106b**.

An optional aspect of the method relates to recording audio of the online meeting. Either the host or the attendee (or both) may initiate an audio recording of the meeting by pressing a "record" button or other user input mechanism on their respective PC-PSTN adaptors **104**. For example, the audio of

15 the meeting may be recorded from the phone connection through one of the adaptors **104** to the computer **106** coupled to that adaptor **104**. In another example, the audio of the meeting is recorded from the phone connection into flash memory in one of the adaptors **104**. In one embodiment, such an audio recordation by an attendee would have to be authorized prior to being enabled. For example, a

20 privilege-to-record field in the attendee adaptor **104b** may have to be enabled prior to allowing the audio recordation of the meeting by way of the attendee adaptor **104b**.

FIG. 3 is a diagram illustrating a method for joining a meeting over a data network in accordance with an embodiment of the invention. The method of

25 FIG. 3 is a continuation of the method of FIG. 2. Here, the host and first attendee are already joined in an online meeting **302**.

Now, it is desired that a second attendee join into the meeting. The second attendee is teleconferenced **304** into the phone connection by the host, and then the host pushes the "start" button or provides similar user input **306**. Upon

30 receiving the "start meeting" user input from the host, the host adaptor **104a** sends **308** the current meeting number to everyone on the phone conference. This is

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accomplished by encoding the meeting number and transmitting the encoded meeting number over the phone connection.

Since the first attendee adaptor **104b** already has the current meeting number, it does not need to respond when it receives and decodes the meeting

5   number over the phone line. The second attendee adaptor **104c** also receives and decodes the meeting number sent by the host adaptor **104a**. However, the meeting number is new to the second attendee adaptor **104c**. As such, in response to receiving the meeting number, the second attendee adaptor **104c** provides an indication **310** to the second attendee that there is an online meeting to join. As

10 discussed above, the indication **310** may be, for example, a visual indication in the form of a flashing light emitting diode (LED) on the second attendee adaptor **104c**.

If the second attendee person wishes to join in the online meeting, then, in response to the indication **310**, the second attendee gives a "join meeting" command **312** by way of a user input mechanism. As discussed above, the user

15 input mechanism may be, for example, pushing a "join" button on the second attendee adaptor **104c**.

The join meeting command along with the meeting identification number is sent **314** from the second attendee adaptor **104c** to the second attendee computer **106c**. The second attendee computer **106c** transmits **316** the join meeting

20 command and the specific meeting number over the data network **107** to a data center **108**. The data center **108** then coordinates the addition of the second attendee computer **106c** to the ongoing online meeting.

FIG. 4A is a top view and FIG. 4B is a side view of an example implementation of the PC-PSTN adapter **104** in accordance with an embodiment of

25 the invention. As shown in the top view, the adaptor **104** may include an LED indicator and three buttons labeled "start", "join", and "record". As shown in the side view, the adaptor **104** may include three interface ports. Two of the ports may be RJ22 jacks, one to connect to a phone base **102**, and the other to connect to a phone handset **103**. The third port may be a USB connector to connect to a

30 computer **106**.

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FIG. 5 is a schematic diagram of the example implementation of the PC-PSTN adapter **104** in accordance with an embodiment of the invention. The example adaptor **104** has various components including: a USB connector **502**; two RJ22 jacks **504a** and **504b**; an LED indicator **505**; three button **506a, 506b**, and

5 **506c**; a microprocessor **508**; SDRAM **510**; flash memory **512**; codec circuitry **514**; and modem circuitry **516**.

The adaptor **104** connects to the computer **106** by way of the USB connector **502**, and connects to the phone handset and base by way of the two RJ22 jacks **504a** and **504b**. The LED **505** is used as an indicator mechanism by the

10 adaptor **104**, for example, to notify an attendee that there is an online meeting to join. The three buttons **506a, 506b**, and **506c** are user input mechanisms and may comprise, for example, the "start", "join", and "record" buttons shown in FIG. 4A.

The microprocessor **508** functions as the controller for the adaptor **104**. The SDRAM (static dynamic random access memory) **510** is high-speed, volatile

15 semiconductor memory utilized by the microprocessor **508** to store and retrieve data. Similarly, the flash memory **512** is non-volatile memory utilized by the microprocessor **508** to store and retrieve data. The SDRAM **510** may be used for data that may be lost if power to the adaptor **104** is lost, while the flash memory **512** may be used for data that is to remain stored even if the power is lost.

20 The codec (encoding-decoding) circuitry **514** is utilized to transform analog voice signals into digital voice signals and vice-versa. The analog voice signals are received and transmitted over the telephone network **101**, and the digital voice signals are communicated to the computer **106** and over the data network **107**. For example, the codec circuitry **514** may include an ADC, a DAC, and a DSP. The

25 ADC (analog-to-digital converter) is used to convert waveforms from analog to digital, and the DAC (digital-to-analog converter) is used to convert waveforms from digital to analog. The DSP (digital signal processor) is used to process signals in digital form. The DSP may include, for example, a voice-over-IP encoder-decoder (VoIP codec).

30 The modem (modulate-demodulate) circuitry **516** is used to modulate data onto an analog signal and also to demodulate data from an analog signal. For

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example, the modem circuitry **516** may comprise a DTMF (dual tone multiple frequency) modulator and demodulator.

In one embodiment, the codec circuitry **514** and flash memory **512** may be utilized to optionally record an audio signal captured by the telephone. For

5   example, the audio signal may be the audio of a meeting. In another example, the audio signal may be a sound memo to be recorded to a file on the computer. The codec circuitry **514** would convert the analog voice signal to digital form, and the flash memory **512** would store the digital audio recording. Alternatively, such an audio recording may be stored at a computer **106**.

10   In one embodiment, the codec circuitry **514** may be utilized to convert an audio message received in a digital format over the data line from the computer **106** to an analog format for playing over the phone line. For example, the audio message may be received from the data center **108**. Such a message may, for instance, include instructions relating to starting, joining, or ending an online

15   meeting, or be an audio signal received from another person received over the Internet. The message may be received via the computer **106** to the adaptor **104** and played to the recipient via the phone handset **103** (or phone speaker).

In one embodiment, power to operate the adaptor **104** may be received by way of the USB connection **502**. Such an embodiment advantageously

20   does not require power from the phone or a separate power connection, and further may be used with both analog and digital phones.

FIG. 6 depicts an alternate configuration of devices including a PC-PSTN adapter in accordance with an embodiment of the invention. Here, the PC-PSTN Adaptor **104** is configured to accommodate and process both analog and

25   digital phone signals. As such, the adaptor **104** may be connected between the phone base **102** and the PSTN **101**. The adaptor **104** is also configured with a connection (for example, USB) to a computer **106** that may be interconnected with the Internet **107**.

While one method for launching and joining a meeting is described

30   above in relation to FIGS. 2 and 3, the adaptor device **104** may be used to launch and/or join a meeting in different ways in accordance with other embodiments of the

invention. For example, a caller ID (CID) function may be used. The adaptor device **104** attached to the attendee's phone may "see" the CID of the Host and provide that telephone number to the attendee's computer. The attendee's computer may in turn access a lookup table (for example, hosted at a data center) that associates the

5 host's telephone number with a meeting number.

In accordance with another embodiment of the invention, the adaptor device **104** enables the phone to make and receive phone calls by way of the computer **106** and the Internet **107**. The adaptor **104** may enable the same phone to make calls either via the PSTN **101** or the Internet **107**. For example, a selection

10 mechanism may be included on the adaptor **104** to select use of either the normal telephone call or a phone call over the Internet.

In accordance with another embodiment of the invention, the adaptor device **104** enables an application on the computer **107** to provide automatic phone answering functionality and/or speed dialing functionality. In the former case, the

15 computer **107** is configured to answer the phone (by way of the adaptor **104**) after a certain number of rings, provide an audio outgoing message, and record a message left by the caller. In the latter case, the computer **107** is configured to store phone numbers, and make calls (by way of the adaptor **104**) using those phone numbers.

In accordance with another embodiment of the invention, the adaptor

20 device **104** enables the phone handset **103** to be used as an audio input to the computer **107**. An application on the computer **107** may capture the audio signal originating from the handset **103**. For example, the audio signal may comprise an outgoing message used in an automatic phone answering system based on the computer **107**, or the audio signal may comprise any other pre-recorded message to

25 be played over the phone.

In the above description, numerous specific details are given to provide a thorough understanding of embodiments of the invention. However, the above description of illustrated embodiments of the invention is not intended to be exhaustive or to limit the invention to the precise forms disclosed. One skilled in the

30 relevant art will recognize that the invention can be practiced without one or more of the specific details, or with other methods, components, etc. In other instances,

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well-known structures or operations are not shown or described in detail to avoid obscuring aspects of the invention. While specific embodiments of, and examples for, the invention are described herein for illustrative purposes, various equivalent modifications are possible within the scope of the invention, as those skilled in the

5   relevant art will recognize.

These modifications can be made to the invention in light of the above detailed description. The terms used in the following claims should not be construed to limit the invention to the specific embodiments disclosed in the specification and the claims. Rather, the scope of the invention is to be determined by the following

10 claims, which are to be construed in accordance with established doctrines of claim interpretation.